

Appl. No. 10/643,435
Docket No. H1799-00222
Response to Official Action of April 5, 2005

REMARKS/ARGUMENTS

A PETITION FOR EXTENSION OF TIME has been filed, concurrently with this Amendment, extending the time for response to the Official Action two (2) months, from July 5, 2005, to September 5, 2005. Applicant notes that September 5, 2005, was a Federal Holiday, therefore making the extension period from July 5, 2005, to September 6, 2005.

As a result of this Amendment, claims 1-8, 10, and 12-13 are under active consideration in the subject patent application.

In the Official Action, the Examiner has:

- (1) rejected claim 10, 11, 13, 14, and 16 under 35 U.S. C. § 112, first paragraph, as allegedly failing to comply with the written description requirement;
- (2) rejected claim 1, 4, 6, 7, and 10-16 under 35 U.S.C. § 103(a) in view of a proposed combination of U.S. Patent No. 4,969,420, issued to McKeon (the "McKeon reference") and U.S. Patent No. 6,263,959, issued to Ikeda et al. (the "Ikeda reference");
- (3) rejected claim 2 under 35 U.S.C. § 103(a) in view of a proposed combination of McKeon and U.S. Patent No. 4,292,345, issued to Kolesnik et al. (the "Kolesnik reference");
- (4) rejected claim 3 under 35 U.S.C. § 103(a) in view of a proposed combination McKeon and U.S. Patent No. 4,980,133, issued to Koch (the "Koch reference");

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(6) rejected claim 8 under 35 U.S.C. § 103(a) in view of a proposed combination of McKeon and U.S. Patent No. 4,197,957, issued to Buhrer (the "Buhrer reference"); and

(7) identified prior art made of record and not relied upon but considered pertinent to Applicant's disclosure.

With regard to Item 1, Applicant's have amended claims 1-8, 10, and 12-13 so as to attend to the issues raised regarding compliance with 35 U.S. C. §112, first paragraph. Support for these changes may be found throughout the specification and claims as originally filed, and at least at page 4 of the specification. No new matter has been entered into the case as a result of these changes to the claims. Claims 9, 11, and 14-16 have been canceled without prejudice to Applicants' right to pursue the canceled subject matter in related applications. Reconsideration and withdrawal of the rejection of claims 10, and 13 under 35 U.S. C. §112, first paragraph, are respectfully requested.

With regard to Item 2, Applicants respectfully traverse the Examiner's rejection of claims 1, 4, 6, 7 and 10-16 in view of the proposed combination of the McKeon and Ikeda references, and request reconsideration for the following reasons.

The present invention provides an improved heat pipe vessel composed of magnesium that is substantially free of aluminum and zinc, but includes magnesium in combination with a gettering metal. This composition of matter, when formed into a heat pipe or loop-pumped system, forms a stable, protective

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layer on the inside wall of the vessel of the heat pipe or loop-pump system, so as to establish a non-corrosive compatibility with a working fluid. The present invention takes advantage of the stabilizing effects of the "getter" type materials, such as zirconium when added to light metals such as magnesium. The addition of zirconium to the magnesium provides a more stable oxide and/or nitride, and provides a water-compatible surface. The fact that this alloy is also lighter than aluminum is an added benefit. The reduced thermal stresses which result with this alloy most likely allow the oxide/nitride to maintain its integrity. Most commercially available magnesium alloys have significant amounts of aluminum, rare earths, and/or zinc as constituents. None of these materials are readily compatible with water.

In order for a prima facie case of obviousness to be established, there must be some suggestion or motivation, either in the reference itself, or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, and the prior art reference must teach or suggest all of the claim limitations [emphasis add] (MPEP §2142). The Examiner's reliance upon the proposed combination of the McKeon and Ikeda references is inappropriate, since when taken as a whole, the combined teachings fail to provide all the elements, either inherently or expressly, required by claims 1-8, 10, and 12-13.

Nowhere within the four corners of McKeon, Ikeda, or for that matter, in any of the other references relied upon by the Examiner, is there disclosure or

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even a vague suggestion of a heat pipe including a magnesium alloy vessel that is substantially free of aluminum and zinc, where that magnesium alloy vessel comprises magnesium in combination with an alloyed and/or dispersion strengthening, gettering metal, as defined in independent claims 1 and 10. At col. 5, lines 29-40, McKeon teaches as follows:

"...The magnesium water tanks of the present invention are fabricated in the following manner. Although the discussion that follows refers to magnesium, it should be understood that magnesium alloys containing up to 10% by weight aluminum, 4% by weight zinc, 0.75% by weight zirconium, 4.25% by weight thorium and 2.0% by weight manganese can be used in the present invention. A particularly preferable magnesium alloy is AZ31B and is available from Dow Chemical. This alloy consists essentially of 3% by weight aluminum, 1% by weight zinc, 0.2% by weight manganese and the balance being magnesium. . . ."

McKeon clearly teaches a glass-lined water tank made from magnesium alloys containing up to 10% by weight of aluminum and 4% by weight of zinc. McKeon goes on further to state that it is particularly preferable for the magnesium to consist essentially of 3% by weight aluminum, and 1% by weight zinc. In stark contrast to the teachings of McKeon, Applicants' independent claim 1 defines a heat pipe formed of a magnesium alloy that is substantially free of aluminum and zinc.

The Examiner admits that McKeon fails to teach or suggest "*...a vessel having a hollow interior cavity at least partially covered by a wick structure . . .*"

The Examiner then relies upon Ikeda to provide these missing teachings to

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McKeon. Applicants respectfully submit that such a proposed combination of otherwise disparate references could only be the result of impermissible hindsight on the part of the Examiner.

More particularly, Ikeda discloses a plate-type heat pipe having two plate members facing each other to form a hermetically sealed container with a working fluid enclosed in the container. Ikeda et al., suggest that their heat pipe may be formed from:

" . . . Aluminum material, copper material, stainless steel material or the like is usually used as the material of the container forming the heat pipe. However, the container as a whole is not necessarily formed by the same material. Different materials may be used as combined to form the container. In addition, water, substituted Freon, alcohol or the like may be used as the working fluid. . . ."

Thus Ikeda, in keeping with prior art design parameters, suggests aluminum, copper or stainless steel as typical materials for forming a heat pipe vessel with water as one acceptable working fluid. However, as Applicants have pointed out in their Background of the Invention section of the present application, such a use of aluminum with water was, at the time the present invention was conceived, known to exhibit significant problems:

" . . . There is a recurring need for heat pipes having low mass. There has been an extended effort to devise a method for using aluminum as the envelope and wick material. Much of this effort has been to use water as the preferred working fluid. Previous efforts have been focused on taking advantage of the fact that aluminum oxide is compatible with water, even though aluminum metal is not compatible. The programs have not been

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successful because of the large difference in thermal expansion between aluminum and its oxide. The resulting stresses cause the oxide layer to crack, often on the first thermal cycle, thereby allowing the water and aluminum to come into contact, resulting in hydrogen generation and heat pipe failure. . . ." (see, pages 2 and 3 of Applicants discussion of the prior art).

Thus Ikeda suggests that a heat pipe having an aluminum vessel with a water working fluid would be a completely satisfactory device according to their invention. Significantly, Ikeda fails to teach or suggest the use of a magnesium alloy at all, let alone one comprising magnesium in combination with an alloyed and/or dispersion strengthening, gettering metal and substantially free of aluminum and zinc. When the disclosures of McKeon and Ikeda are combined, as suggested by the Examiner, a vessel is suggested that comprises either aluminum alone or magnesium alloys containing up to 10% by weight of aluminum and 4% by weight zinc. The combination of McKeon with Ikeda does not even vaguely suggest that a heat pipe vessel could be formed from magnesium in combination with an alloyed and/or dispersion strengthening, gettering metal that is substantially free of aluminum and zinc, absent impermissible hindsight on the part of the Examiner. The Examiner is referred to In re Bond, 910 F.2d 831, 15 U.S.P.Q. 2d 1566 (Fed. Cir. 1990) which held that the PTO erred in rejecting a claimed invention as an obvious combination of the teachings of two prior art references when the prior art provided no teaching, suggestion, or incentive supporting the combination. Such is exactly the situation presented by the proposed combination of McKeon with Ikeda.

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Accordingly, Applicants respectfully submit that claims 1-8, 10, and 12-13 define patentable subject matter over the combination of the McKeon and Ikeda. Reconsideration and withdrawal of the Examiner's rejection of claims 1-8, 10, and 12-13 under 35 U.S.C. §103 are respectfully requested.

With regard to Item 3, Applicants respectfully submit that the disclosure provided by U.S. Patent No. 4,292,345, issued to Kolesnik et al., fails to provide the deficiencies inherent in the McKeon reference so as to support the combination postulated by the Examiner. More particularly, the Examiner admits that McKeon does not disclose a stable protective layer in the form of an oxide or nitride. Although Kolesnik appears to disclose a method of protecting carbon-containing component parts of metallurgical units from oxidation in which an oxide is discussed, Kolesnik utterly fails to disclose such a composition of matter in connection with a magnesium alloy vessel that is substantially free of aluminum and zinc, as defined by independent claims 1 and 10. Moreover, the prior art taken as a whole fails to suggest or to provide the requisite motivation to combine the references. Accordingly, Applicants respectfully submit that claim 2 is allowable, at least through dependency.

With regard to Item 4, the Examiner admits that McKeon fails to disclose a heat pipe or a pumped-loop system. While U.S. Patent No. 4,980,133, issued to Koch may disclose an apparatus comprising two tandemly aligned heat pipes separated by a conductive sleeve, Koch utterly fails to disclose, or even vaguely suggest a magnesium alloy vessel substantially free of aluminum and zinc,

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where the magnesium alloy vessel comprises magnesium in combination with an alloyed and/or dispersion strengthening gettering metal. Once again, McKeon clearly suggests that the inclusion of both aluminum and zinc is desirable. Claim 3 is allowable.

With regard to Item 5, the Examiner admits that McKeon does not disclose the use of ammonia as a working fluid. Here again, although U.S. Patent No. 5,771,967, issued to Hyman, appears to disclose a heat pipe that utilizes ammonia as a working fluid, there is absolutely no suggestion within either McKeon or Hyman of a heat pipe including a magnesium alloy vessel substantially free of aluminum and zinc, where the magnesium alloy vessel comprises magnesium, in combination with an alloyed and/or dispersion strengthening, gettering material. Claim 5 is allowable.

With regard to Item 6, the Examiner admits that McKeon does not disclose the use of a zirconium alloy that is about 0.6% by weight. The Examiner has relied upon U.S. Patent No. 4,197,957, issued to Buhrer for the provision of a vacuum-tight assembly that provides zirconium alloy.

More particularly, Buhrer discloses a vacuum-tight assembly where a metal is joined to a ceramic article such as a metal vapor arc lamp discharge tube. Buhrer has discovered that a vacuum-tight assembly for a metal arc lamp can be formed of vanadium or a vanadium alloy end-cap structure which positions a lamp electrode when utilizing a discharge tube formed from a high

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density polycrystalline or single crystal ceramic compositions having a perovskite structure.

Buhrer has nothing whatever to do with the subject matter defined by Applicants' claims. The Examiner is reminded that a prima facie case of obviousness is only when there is some suggestion or motivation, either in the reference itself, or in the knowledge generally available to one of ordinary skill in the art, to combine reference teachings, and the prior art reference must teach or suggest all of the claim limitations. Moreover, nowhere with the four corners of the Buhrer reference is there disclosure or even a vague suggestion of an inventive structure for use in thermal transfer or heat management applications, such as a heat pipe, pumped-loop system, or the like, as defined by Applicants' claims. Significantly, within the first full paragraph of Buhrer's "Description of Specific Embodiments" section, he clearly states that representative suitable ions for use in forming his device include aluminum.

There is simply no basis in law for the combination proposed and relied upon by the Examiner in rejecting claim 8. Claim 8 is allowable.

In summary, Applicants submit that the unique heat pipe defined by claims 1-8, 10, and 12-13 is not disclosed in the prior art references, taken as a whole, and there is no teaching or suggestion in the references to support their use in the particular claimed combinations. In the absence of such, the references are improperly combined. In any event, claims 1-8, 10, and 12-13 define over any combination of McKeon with Ikeda, Kolesnik et al., Koch, Hyman, or Buhrer.

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In view of the foregoing, Applicants respectfully submit that claims 1-8, 10, and 12-13 are in condition for allowance. Favorable reconsideration is therefore respectfully requested.

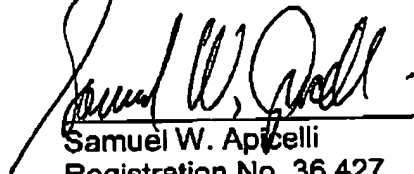
With regard to Item 7, Applicants have considered the prior art references identified by the Examiner as pertinent and determined that none of them, taken alone, or in any valid combination with the McKeon, Ikeda, Kolesnik et al., Koch, Hyman, and Buhrer references anticipates or renders obvious the present invention.

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If a telephone conference would be of assistance in advancing prosecution of the above-identified application, Applicant's undersigned Attorney invites the Examiner to telephone him at 215-979-1255.

Dated: September 6, 2005

Respectfully submitted,



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